TOP SECRET
ISINGLASS

25X1A

HANDLE VIA [redacted]
CONTROL SYSTEM

[redacted] 25X1A

Cy [illegible]

20 JUL 1965

MEMORANDUM FOR THE RECORD

SUBJECT : ISINGLASS Briefing of Dr. McMillan at Headquarters on 13 July 1965.

1. The briefing began with opening remarks by General Ledford and introduction of [redacted] who reviewed technical progress on the program to date. 25X1A

25X1A 2. [redacted] had barely begun his portion of the presentation when Dr. McMillan opened with a barrage of questions including the following:

a. Had a detailed analysis been made of flight paths, with launch points and landing sites? 25X1D

25X1A b. Had these analyses if done, included studies of targets per flight with specific target requirements?

25X1A [redacted] answered in the affirmative and specifically referred to the West to East [redacted] mission which gives coverage of 300 COMAR targets.

c. Dr. McMillan then questioned the validity of the claimed quick reaction capability with a four to five hour flyout time for the B-52 plus a one hour mission time and another 12 hours to get the film back to Rochester or some other place.

d. Dr. McMillan also questioned to what extent studies had been conducted on "throw away" boosters reminding [redacted] that you could have a reuseable vehicle without a reuseable booster. 25X1A [redacted] stated

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that this concept results in use of an M122 type vehicle which will not accommodate a one foot resolution camera and that studies of this vehicle have included cost comparisons with the 192 vehicle.

e. Dr. McMillan then wondered where the requirement for 7,000 nautical miles range came from, and said that his back of the envelope calculations showed that a vehicle with 5,000 nautical mile range would have only half the launch weight. Dr. McMillan added that a 5,000 mile range vehicle could be launched over the Mediterranean Sea and recovered over the Indian Ocean, for example.

25X1A [redacted] answered that the 7,000 nautical mile range reduced to 5,000 miles for maneuver and relite missions. Dr. McMillan then commented that he didn't see the vulnerability advantage of these missions but we would get to that later. At this point he also referred to the ISINGLASS vehicle as an excuse for a pilot to fly over the Soviet Union. Dr. McMillan also then repeated that this system had to be carefully analysed on the basis of a reasonable reconnaissance mission on a targets per dollar basis.

f. Dr. McMillan requested the flight mach numbers for this vehicle over the Soviet Union on the West-East mission and 25X1A [redacted] responded with the answers.

g. A question then arose to the effect that development costs did not seem comparable for a smaller vehicle to which 25X1A [redacted] answered that their cost studies had been priced out on the basis of 40 R&D missions and 100 operational missions in five years.

h. Dr. McMillan commented on these cost discussions to the effect that he could develop a satellite system for 25X1A [redacted] that would cover about the same specific targets in a given time period.

25X1A 3. [redacted] then continued his portion of the presentation with further questions by Dr. McMillan and Dr. Flax.

a. Dr. Flax indicated that he did not understand the reason for the higher cost for the unmanned system.
25X1A [redacted] answered that this was due mainly to the higher attrition rate of unmanned R&D vehicles and Dr. Flax then commented that this was inconsistent with anything else he has seen and he was sure that this was not the case for GEMINI and MERCURY. Mr. Lewis then referred to a loss of an unmanned MERCURY flight due to an Atlas booster explosion and Dr. McMillan commented with a chuckle that the ISINGLASS vehicle "looked like quite a firecracker too".

b. Dr. McMillan then referred again to a comparison of costs with satellite systems. General Ledford then commented on possible vulnerability disadvantages of
25X1A satellite systems in light of the Soviet "Henhouse" installations.

25X1A [redacted] added that [redacted] would be glad to go back and look at cost comparisons of various systems based
NRO on expected numbers of missions per year.

c. Dr. Flax then asked what weight penalty was attributed to the man in the system and [redacted] 25X1A answered 2,000 lbs., with the unfueled weight of the unmanned system at 23,500 lbs. and the comparable weight for the manned system at 25,500 lbs.

d. Dr. McMillan then wanted to know what scaling was used for the wind tunnel models and the answer was given at 1/10.

25X1A 4. [redacted] then covered the launch aspects of the system from the B-52 aircraft including the range of possible launch altitudes as affected by the buffet boundary of the B-52.

a. Dr. Flax questioned the buffet boundaries shown and wondered if these applied to a "clean" B-52 to which the answer was yes.

b. Dr. Flax commented that there didn't seem to be much data in the transonic range and in the case of other vehicles of this type required aerodynamic changes to improve transonic performance had resulted in reduced hypersonic performance. [redacted] commented that their "work horse" tunnel had been [redacted] own polysonic tunnel in which they have 900 test hours and were willing to go into this background as thoroughly and completely as desired.

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c. Dr. McMillan then indicated he was still concerned about the relative performance merits of the vehicle with an integral versus a disposable booster. Weight ratios of take off to glide weight were quoted as 10/1 for a M122 type vehicle and 5/1 for the M192 type vehicle. [redacted] explained that larger vehicles are more efficient since their L/D values are improved. It appeared that [redacted] did not fully explain the advantages of including the tankage in the ISINGLASS vehicle to provide a vehicle with a good L/D and low wing loading with a much improved thermal environment. A general discussion of the tradeoffs of range, payload, L/D and wing loading did follow, however, to which Dr. McMillan commented that this brings us back to the payload required for one foot resolution and the question whether the one foot requirement is a real one.

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5. Dr. McMillan then said that we still haven't addressed the need here versus the cost of a [redacted] program. He further commented that this was not an instrument for search for such information as where troops are deployed or what planes are lined up on a given runway, etc. He commented that you don't need one foot resolution for this and it would take many 60 foot swath widths to cover the Soviet Union and China. He referred to the

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current problem of trying to locate troops in South China. He again repeated that the key question here is the need for such a system.

25X1A [redacted] is to be complimented for giving a composed, technically excellent briefing, answering all questions with a direct factual response. His composed performance was reminiscent of that given by Britain's Prime Minister Macmillan at the historic U.N. General Assembly meeting while Premier Khruschev performed his now famous pounding the shoe on the table act.

6. [redacted] then began his portion of the presentation covering structural and materials aspects of the M192 vehicle.

25X1A a. Dr. Flax wanted to know what actual experience [redacted] had with nickel and columbium coatings. [redacted] explained that this was TD nickel and he also
25X1A referred to Pratt and Whitney's experience with this material. Dr. Flax was shown a leading edge section of coated columbium which had been flown on an Asset vehicle.

b. Dr. McMillan commented that the parts life problem goes back to the range requirement with more mission life for reduced range missions. He said that he still couldn't believe that the 7,000 nautical mile range was really an intelligence requirement. A question also arose from Dr. McMillan concerning ablative versus radiative cooling and Dr. Flax reminded him that the L/D crossover point of ablative versus radiative cooling is generally considered to occur at an L/D of 1.2.

25X1A 7. A detailed review of the vehicle structural sandwich was given by [redacted]

a. Dr. Flax asked if [redacted] was really happy
25X1A with the water wick concept since even distribution of water over a vehicle surface during maneuvers etc.,

would be a problem. The main recurring theme of Dr. Flax's questions throughout the briefing was "sure these things work fine in the laboratory but making them work in an actual vehicle situation is something else", a problem, I believe, already quite well appreciated by everyone. [redacted] explained the partitioning concept planned for the water wick in the M192 vehicle as a means of assuring even water distribution in the wick.

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b. Dr. Flax also had many specific questions on the roll bonding process planned for the titanium tank structure. It should probably be remembered here that both of these gentlemen had refused to take advantage of extended offers for a thorough briefing and inspection trip to [redacted] to review the M192 program.

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c. Dr. Flax questioned the free stream stagnation temperature in the [redacted] tunnel and this was quoted by [redacted] as being about 3000° F compared to the 8000° F in true flight and that the [redacted] facility is not a true enthalpy simulation tunnel and that standard correlation techniques were used to correct for this effect.

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8. [redacted] of Pratt and Whitney then gave his portion of the briefing covering propulsion system aspects of the M192 system. Only one question was raised on the propulsion system and this was from Dr. Flax in regard to the ?c * values quoted from test stand combustion chamber tests and whether or not these values included cooling loss. [redacted] answered that the ?c * represented only the combustion efficiency alone and an overall loss correction was added later to allow for cooling loss as shown on some of his previously discussed charts.

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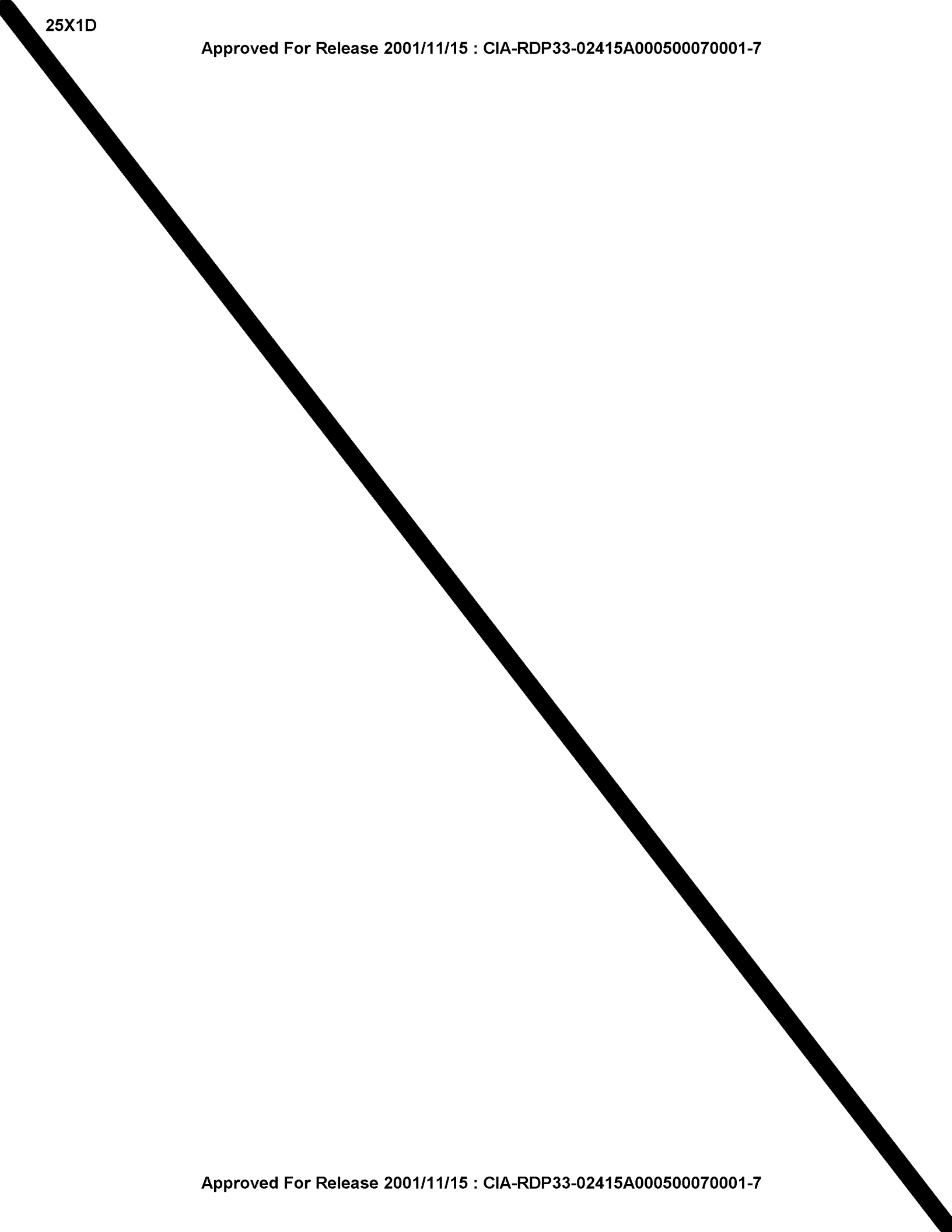
9. [redacted] of OSI then gave a view graph support presentation of the vulnerability aspects of the M192 vehicle.



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25X1D [redacted]

10. a. General Ledford then began his portion of the presentation covering the proposed six month feasibility program and was immediately interrupted by Dr. McMillan's statement that he still had not seen any requirement for this system that could not be met by an unmanned vehicle, by a Ramjet vehicle or a Scramjet vehicle or a satellite. He stated that what was really needed amounted to interpretation in more detail of the use of this vehicle against COMAR targets, and that the ISINGLASS vehicle can't possibly compete on a cost effectiveness basis for one foot technical intelligence. He recalled being shown cost effectiveness comparisons of the ISINGLASS system with satellites at the previous briefing given him by D/TECH and said these numbers were stretched a bit to make the ISINGLASS system look more effective.

b. Dr. McMillan stated that the question of whether the ISINGLASS system should be used for indications intelligence where he thinks it fits better or for technical intelligence gets into a whole new set of questions. He said however, its use for indications intelligence would involve some definite risks when a B-52 flys up to someone's coast line and launches "this missile".

c. Dr. McMillan then indicated that he would be interested in knowing if the operational costs included turn around costs, overseas facilities for liquid hydrogen and oxygen and cost of bringing the vehicle back to the U.S. after a mission which ended overseas.

d. Dr. Flax said he would be interested in seeing a detailed breakdown of RDT&E costs "to see if he can make it fit with anything else he knows about". He

said a rough indication of development costs could be based on gross weight with the 25,000 lbs. of this vehicle (without fuel) compared to the development cost of the 12,000 pound Dynasoar indicating development costs for the vehicle alone of something like [redacted] NRO 25X1A
Dr. Flax added (with reference to the sandwich panel 25X1A5A1 shown by [redacted]) that he had seen B-70 type stainless steel honeycomb panels "played with" in the laboratory many years ago but building a B-70 from this material was quite another matter.

e. Dr. McMillan stated that he saw [redacted] 25X1A5A1 main interest as representing a plea for a boost glide vehicle development.

11. Dr. Flax then commented on the planned Air Force program for development of a demonstrator high pressure rocket engine. He said the program still needs the blessing of OSD but at least it is included in the Air Force Five Year Program. He indicated that as a result of the evaluation of the program by the Rocket Propulsion Lab, building a demonstrator engine in 12 months was considered risky; could be accomplished in 18 months with pressure but could more realistically be built in 24 months. He described this demonstrator as being a complete engine but that some of the non-major components may not represent flight weight designs. He added that negotiations on the engine program are now about to begin.

12. Some of Dr. McMillan's concluding remarks were:

a. That as a result of the review of the ISINGLASS program by Gen. Schriever's people, they had concluded 25X1A5A1 that [redacted] was not by any means in a position to single source this type of development.

b. That this was the most widely briefed covert program he had ever encountered.

13. Mr. Parangosky stated in closing remarks that if necessary, a paper could be forwarded to Dr. McMillan which

would include more detailed cost effectiveness studies comparing ISINGLASS with competitive systems. Mr. Parangosky also added that papers would be prepared detailing stated USIB requirements relevant to the ISINGLASS program and the reasons favoring the development of a vehicle with a 7,000 nautical mile range capability.

14. The following attendees were present at the briefing:

NRO

Dr. McMillan
Dr. Flax

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[redacted]

Headquarters

Gen. Ledford
Mr. Cunningham
Mr. Parangosky

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[redacted]

[redacted]

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Pratt & Whitney

[redacted]

25X1A

Perkin-Elmer

[redacted]

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[redacted]

Aircraft Systems Division
(Special Activities)

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HANDLE VIA [redacted]
CONTROL SYSTEM

OXC-2704-65

25X1A ASD/OSA/[redacted]:gp (20 July 1965)
Distribution:
Cy 1,2 - ASD/OSA
3 - D/TECH/OSA
4 - DD/S&T
5 - AD/OSA
6 - DAD/OSA
7 - APD/OSA
8 - chrono
9 - RB/OSA

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